INSTRUCTION MANUAL

MODEL PM 300-1

SER. NO.

MILLIVAC INSTRUMENTS

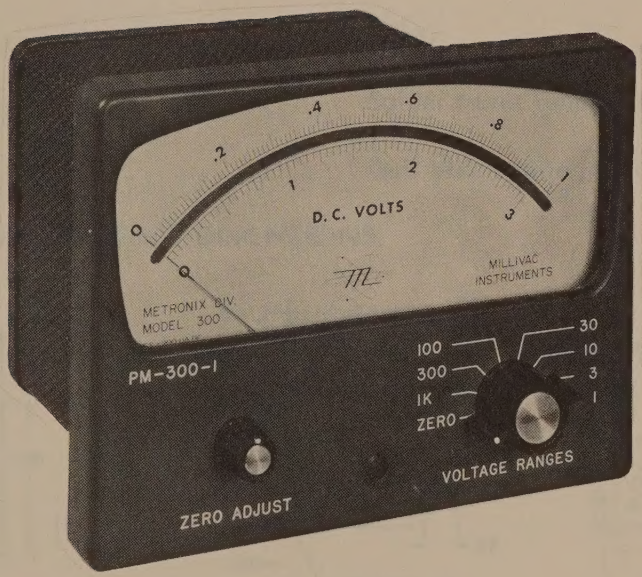
OPERATING MANUAL

FOR

MODEL PM-300-1
MODEL PM-300C-1

PANEL MOUNTING ELECTRONIC VOLTMETER

SERIAL NO. _____



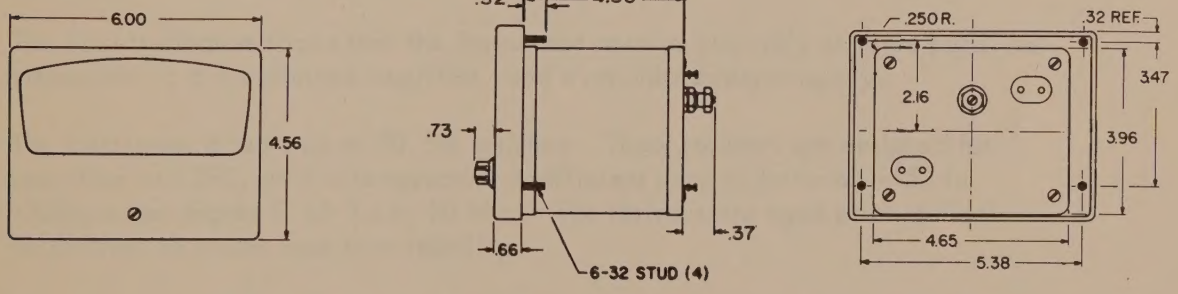
METRONIX DIVISION OF
MILLIVAC INSTRUMENTS, INC.

P.O. Box 997
Schenectady, N.Y.

SPECIFICATIONS

ACCURACY	±1% of FS on all ranges
VOLTAGE RANGES	0-1/3/10/30/100/300/1KV, DC
WARM-UP TIME	5 minutes
INPUT IMPEDANCE	10 megohms
TUBE COMPLEMENT	(1) 7316 (1) OB2 (1) 6TF4
POWER LINE REQUIREMENTS	14 watts @ 117/230V ±10%, 50-400Hz
ZERO DRIFT	Less than ±1% of FS
WEIGHT	3 lbs.
CONNECTIONS	Solder turret terminals
COLOR	Dull black meter; black wrinkle dust cover

METER OUTLINE AND MOUNTING DIMENSIONS:



GENERAL

Like all METRONIX panel-mounted electronic voltmeters, the Models PM-300-1 and PM-300C-1 have been developed especially for incorporation into complex electronic instrumentation. They are being used extensively in such equipment as production test stands, aircraft and missile ground support equipment, firing controls, remote metering set-ups, etc.

Both Model PM-300-1 (left-zero) and Model PM-300C-1 (center zero) are d-c measuring devices with high input resistance and stability. They are usually provided with a db type input attenuator having the following ranges: 1/3/10/30/100/300 and 1,000 volts, f.s.d. Rated accuracy is ±1% of f.s.d. For special purposes this instrument can be provided with any combination of ranges between one and eleven, special scaleplates and sensitivities from 500 millivolts up. We will be happy to quote on your special requirements.

This instrument has been designed incorporating the use of a printed circuit board with many of the components mounted directly to it. If it becomes necessary to change components, it is mandatory that the replacement parts be the same as those specified in the parts list.

Metronix Division of Millivac Instruments, Inc. maintains a service department and it would be advisable in case of major repairs to return the instrument in question to Millivac. This is specially advisable because some of the components used are not available from the stock of local distributors.

CIRCUIT

The circuit diagram shows that the instrument consists basically of three parts; an attenuator, a d-c balanced amplifier, and a regulated power supply.

The attenuator is built up of ±0.5% resistors. These resistors are designed for operation to 125C, with a temperature coefficient varying between -150 to -300ppm per degree C for 1Ω to 10 MΩ. The resistors are aged prior to final calibration to assure long term stability.

As to the d-c amplifier, this is a time proven balanced cathode follower circuit. The meter is placed between the cathodes of tube V1, while calibration is achieved through variable resistor R8, in series with the meter. The meter balance is established by adjusting the ZERO ADJUST potentiometer on the front of the instrument. This control should be operated with the range switch in the METER ZERO position. The above mentioned R8 is located on the back of the instrument and is marked CALIBRATION. All components are dimensioned for continuous duty.

To assure a high degree of accuracy, this instrument has a fully regulated power supply. The plate supply, using a OB2 (V2) tube provides a stable d-c voltage while the filament is regulated by means of a ballast tube - type 6TF4. This takes care of all voltage changes within the specified limits of 115 volts a-c ±10%.

TERMINALS

The power input terminals and the signal input terminals, so identified, are located and are accessible at the rear of the instrument.

CALIBRATION PROCEDURE

After sufficient warm-up with the range switch in the METER ZERO position, set the ZERO ADJUST for correct position. Then depending on the full scale sensitivity of the most sensitive range, a d-c voltage source is preset to that voltage level while being monitored by the secondary standard voltmeter or potentiometer. Such an instrument should have an accuracy at least two times better than the desired accuracy of the electronic voltmeter under test.

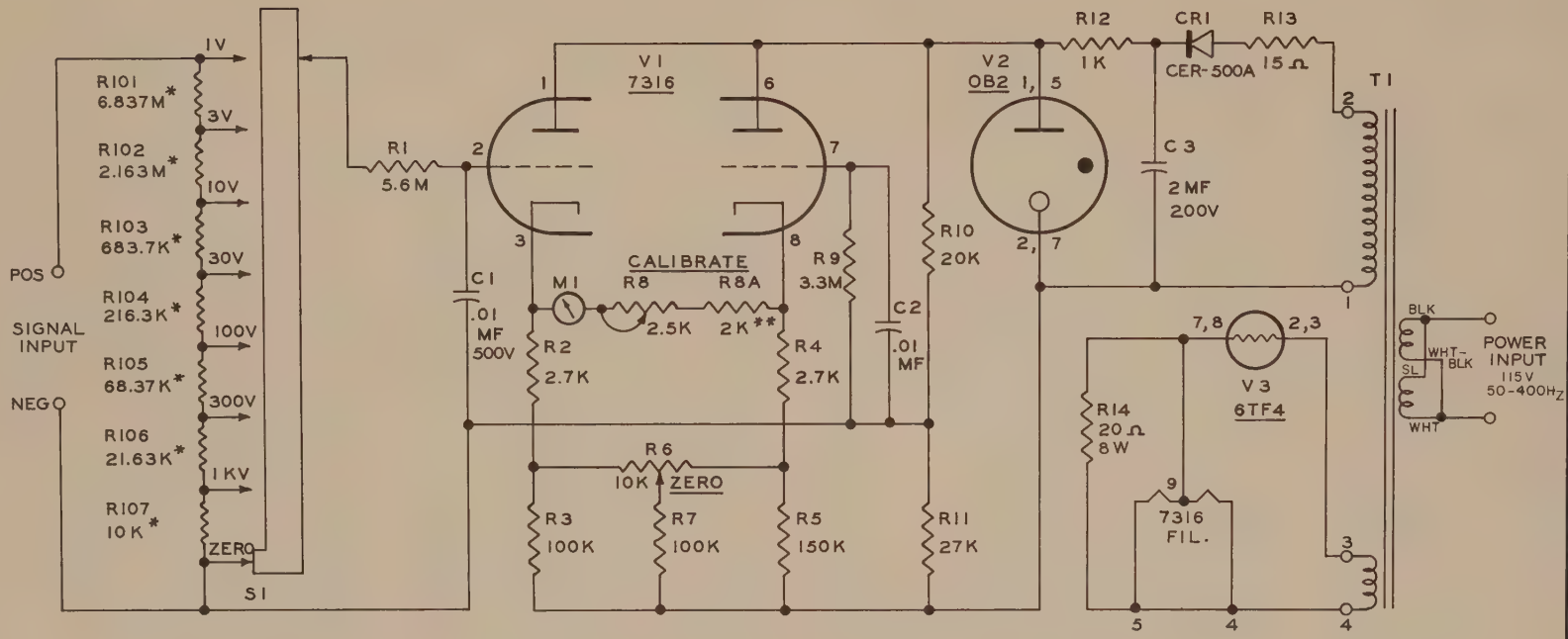
If there is a discrepancy between the readout of the reference standard and the electronic voltmeter under test, loosen the potentiometer R8 locknut and reset the potentiometer to achieve the proper reading. Then tighten the locking device again and check several points over the whole range for linearity. The scale distribution (linearity) should be ±1% or better. Next, switch the instrument to the following higher range and increase the d-c reference standard and voltage source to the f.s.d. level of this range. The maximum error must not exceed that of the f.s.d. accuracy specified without the necessity of resetting the calibration potentiometer. This operation should be repeated for all the ranges.

Where the instrument is exposed to vibration or shocks, it is advisable to seal the potentiometer shaft to the locknut with a drop of cement.

CKT SYM	DESCRIPTION	METRONIX PART NO.	MANUFACTURER & MF'R. PART NO.
C1, C2	Capacitor, ceramic, disc 0.01μFD, 500V	610-1009	Erie 811-000-Z5U-0-103M
C3	Capacitor, metalized Mylar 2.0μFD, 200V	630-1004	Wesco 29MM
CR1	Diode, silicon	101-0500	Sarkes-Tarzian CER-500A
M1	Meter, indicating		
	0-200μA Movement (PM-300-1)	203-2001	
	100-0-100μA Movement (PM-300C-1)	203-2003	
R1	Resistor, fxd. comp. 5.6M ±10%, 1/2W	500-565	
R2, R4	Resistor, fxd. comp. 2.7K ±10%, 1/2W	500-272	
R3, R7	Resistor, fxd. comp. 100K ±10%, 1/2W	500-104	
R5	Resistor, fxd. comp. 150K ±10%, 1/2W	500-154	
R6	Resistor, variable, comp. linear taper 10K ±30%, 1/4W	580-1037	
R8	Resistor, variable, comp, linear taper 2.5K ±30%, 3/10W	580-1043	
R8A*	Resistor, fxd. metal film 2K ± 1%, 1/4W	512-2001	
R9	Resistor, fxd. comp. 3.3M ±10%, 1/2W	500-335	
R10	Resistor, fxd. comp. 20K ±10%, 1/2W	500-203	
R11	Resistor, fxd. comp. 27K ±10%, 1/2W	500-273	
R12	Resistor, fxd. comp. 1K ±10%, 1/2W	500-102	
R13	Resistor, fxd. comp. 15Ω ±10%, 1/2W	500-150	
R14	Resistor, fxd, WW, 20Ω ±10%, 8W	550-1000	
R15 thru R100	Not assigned		
R101	Resistor, carbon film, 6.837M ±0.5%, 3/4W	521-68373	
R102	Resistor, carbon film, 2.163M ±0.5%, 1/4W	521-21633	
R103	Resistor, metal film, 683.7K ±0.5%, 1/4W	521-68372	
R104	Resistor, metal film, 216.3K ±0.5%, 1/4W	521-21632	
R105	Resistor, metal film, 68.37K ±0.5%, 1/4W	521-68371	
R106	Resistor, metal film, 21.63K ±0.5%, 1/4W	521-21631	
R107	Resistor, metal film, 10K ±0.5%, 1/4W	521-1002	
S1	Switch, range, rotary (switch only)	410-1012	
	Switch, range, rotary (complete ass'y)	420-1012	
T1	Transformer, power	300-1011A	Dyco 1264
V1	Tube, electron, 7316	110-1205	Amperex 7316
V2	Tube, electron, OB2	110-1208	RCA OB2
V3	Tube, ballast, 6TF4	110-1207	Amperite 6TF4
	Miscellaneous		
	Cover, dust	820-2006	
	Knob, range switch	800-4131	Buckeye PS-50BL-2
	Knob, ZERO control	800-4130	Buckeye PS-50D-1
	4-Nuts, mtg, knurled 6-32x5/8	850-1000	

* Resistor value selected at factory; nominal value shown. Used only on PM-300C-1

REVISIONS			
SYM	DESCRIPTION	DATE	BY
A	REVISED	3-65	NG



NOTES:
1. S1 SWITCH IS IN MAX. CW POSITION.
2. RESISTORS MARKED BY * ARE DEPOSITED CARBON, 1/2 W ± 0.5%; ALL OTHER RESISTORS ARE COMPOSITION, 1/2 W ± 10%.
3. RESISTORS MARKED BY ** ARE FACTORY ADJUSTED. AVERAGE VALUE SHOWN.
4. R8A IS OMITTED IN MODEL PM-300-1.
5. THIS DIAGRAM APPLIES TO METERS WITH SER. NO. 10066 AND UP.

DRAWN: NG	TITLE: CIRCUIT DIAGRAM FOR DC MULTI-RANGE VOLTMETER TYPE PM-300-1 OR PM-300C-1		
CHECKED:	NAME: METRONIX DIVISION OF MILLIVAC INSTRUMENTS, SCH'DY, N.Y.		
DATE: 4-22-64	SCALE	SIZE	DWG NO.
APPROVED: a.f.	NONE		300-1-C-10001A

GUARANTEE

Millivac Instruments, Inc. guarantees each instrument manufactured by us to be free from defects in material and workmanship for a period of one year from date of delivery to the original purchaser. Repairs during this time will be made by us free of charge, but transportation charges both ways will be borne by the customer.

Excluded from this guarantee are tube and transistor replacements, as well as all damages caused by, or related to, abuse of the instrument either electrically or mechanically. In this case, repairs will be billed at cost and an estimate will be submitted for your approval before the work is started.

If an instrument is believed to be defective, please notify our Service Department, giving the model number and serial number of the instrument, as well as describing the nature of the trouble. Our Service Department will then, if necessary, authorize the return of the instrument under the terms of this guarantee and advise how shipment should be made.

CLAIM FOR DAMAGE IN SHIPMENT

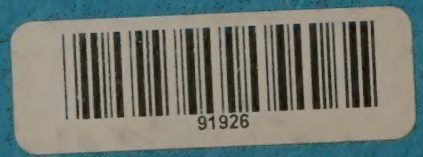
If, on receipt, the shipping cartons appear to be crushed or torn, as evidencing rough treatment, a notation should be made on the carrier's delivery receipt indicating this condition.

As each item is opened, it should be inspected to ascertain that no damage has been incurred during shipment. If no damage is visible, operational checks should be performed to make sure that the equipment arrives in its original operating condition. If any damage is revealed, a claim should be filed immediately with the carrier, stating the extent of the damage. A copy of this report should be forwarded to us along with the model and serial number of the instrument. Millivac will then advise how the instrument should be returned for repair or replacement.

SHIPPING INSTRUCTIONS FOR RETURNS TO FACTORY

No instrument should be returned to the factory without prior authorization from Millivac Instruments, Inc. or our authorized representative.

Shipping instructions will be given at the time return of an instrument is authorized. In all cases the instrument should be packed in a strong container and surrounded by sufficient shock-absorbing material.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